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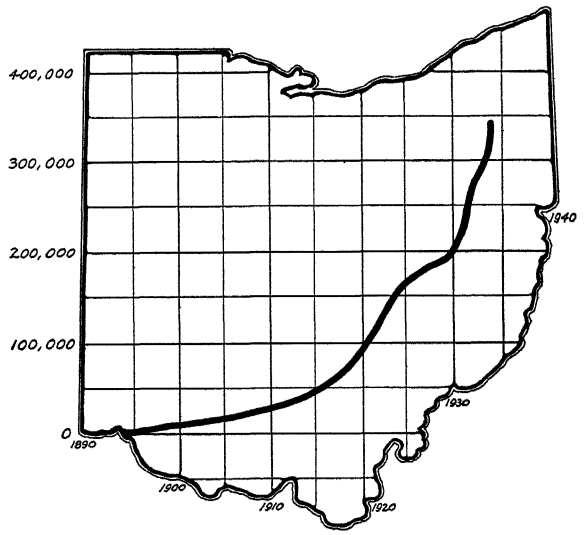
ALFALFA

IN OHIO FARMING



THE MARCH OF OHIO'S ALFALFA ACREAGE

Department of Agronomy
Ohio State University

THE OHIO STATE UNIVERSITY AND THE U. S. DEPARTMENT OF AGRICULTURE, COOPERATING
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*Alfalfa in Ohio Farming**

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ALFALFA is nearly a perfect forage crop. No other crop can be used as successfully in so many ways in Ohio farming. It excels in yields, permanence, feeding values, and suitability for all types of livestock. Alfalfa residues so activate the physical, chemical, and biological processes of the soil that the immediate crop-producing power is increased. As a feed crop, alfalfa now commands the highest recognition. Its broader values are not generally appreciated, though they give alfalfa a key place in Ohio farming.

FLEXIBLE ROTATIONS MADE POSSIBLE

Alfalfa lends flexibility to the rotation. Short rotations with alfalfa are practical; long ones equally so. The farmer may choose to occupy a field with alfalfa for one, or two, or three, or more years. Alfalfa takes the fixedness out of the traditional rotation. It is this elastic feature that enables the farmer to more quickly adjust cropping to align with market trends or cycles. With unfavorable grain prices, acreages can be readily reduced by permitting the alfalfa meadows to stand one or more additional years.

BETTER USE OF SOIL CAPACITIES

Established alfalfa plants have deep root systems which enable them to get water and much of the required mineral nutrients from considerable depths.

Farms the Subsoil.—Calcium or lime is required by alfalfa both as a nutrient and as a neutralizing agent for soil acidity. A large proportion of the more suitable alfalfa soils of Ohio are characterized by a distinct lime layer at a depth of 18 to 36 inches. When the alfalfa roots reach this layer, the lime needs of the plant are adequately satisfied. Moreover, the roots draw on the potash and phosphate stores of the lower soil. No other crop can so fully capitalize on these subsoil resources.

Increases Soil Productivity.—Alfalfa also aids the crops which follow it to make better use of the soil. Tilth is improved through the incorporation of the alfalfa roots, the amount of which may exceed 2500 pounds dry matter per acre in the first foot of soil. These roots contain 55 pounds of nitrogen, 11 pounds of phosphoric acid, and 12 pounds of potash. The activating effects of alfalfa residues on the chemical and biological processes of the soil are pronounced. In soil improving value, one year of alfalfa has proved superior to one year of red clover in a 3-year rotation at the Ohio Agricultural Experiment Station (Fig. 1).

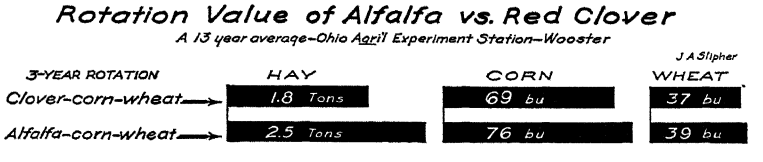


FIG. 1

* The procedures recommended in this bulletin are mostly based on the extensive researches reported in Ohio Agricultural Experiment Station Bulletin 540 (1934) "Alfalfa in Ohio."

Alfalfa Freer from Many Hazards

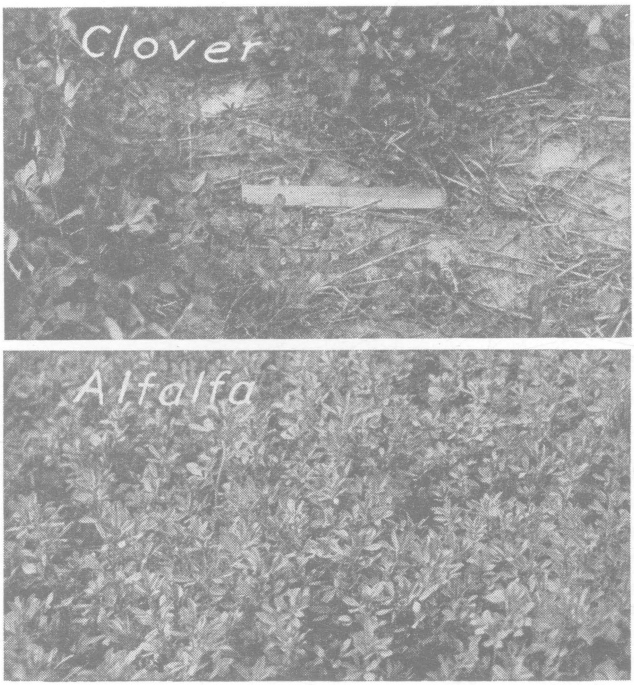


Fig. 2.—Alfalfa establishes itself in dry seasons. Alfalfa and red clover sown April 5 of drouth year 1930. Photos May 15, 1931.

Alfalfa is subject to less hazards than most other hay crops. On adapted soils, alfalfa can be established just as readily as any of the other legumes.

Alfalfa is the best legume to establish itself in moderately dry seedbeds (Fig. 2). In established meadows, alfalfa is also superior to other legumes under drouth conditions. Its extensive, deep-penetrating root system gets all the usable water to be had in the lower soil. The longer life of alfalfa necessitates less frequent seeding than with the clovers.

Market Proximity Favors Cash-Crop Alfalfa

Proximity of consuming dairy districts gives Ohio's market alfalfa a substantial advantage. Differentials in transportation costs favor the Ohio producer. High grade alfalfa hay can be and is being produced in Ohio, and Ohio hay can meet the demands of a discriminating market. The marketing problem is largely one of developing a deserved reputation for quality hay.

Alfalfa Excels as a Producer of Feed

In yield of forage, alfalfa is the leader. Judged by all standards of feeding excellence, this forage is unsurpassed. Its protein, mineral, and vitamin contents, its palatability and digestibility, combine to set it above other hays. Four times the present legume forage acreage—½ acre per unit of livestock—could be utilized effectively for feeding in Ohio. Alfalfa, alone or in combination with other hay plants, ranks high for feeding each type of livestock. As meal it is utilized effectively in rations for swine and poultry. High carrying capacity in mid-summer admirably fits the crop for pasturing.

Where and When Shall Alfalfa be Grown?

The excellence of a crop is one thing; its applicability to a given farm is another. Not every one should attempt alfalfa—it is not universally applicable. Soil conditions and other circumstances determine what legume is *best* for each case. Under situations favorable to its growth, alfalfa offers most.

Soil Suitability Rests on Drainage

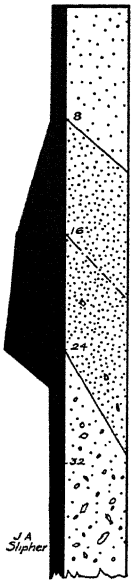


Fig. 3.—Graphic profile of soil group having "Prime Suitability" for alfalfa with reference to drainage. Width of black slab represents resistance to water movement.

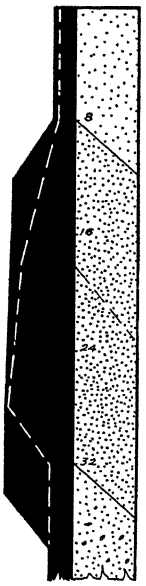


Fig. 4.—Graphic profile of soil group having "Good Suitability" for alfalfa. Dark colored soils are more resistant to water movement—full slab; light soils, less so—inner slab.

To qualify for alfalfa growing, a soil must be drainable. Whether one should attempt the crop on his farm rests fundamentally upon the efficiency of the soil in conducting excess water through the subsoil to natural underground outlets or to tile lines.

Sensitive About Water

Alfalfa is more exacting than other field crops in requiring the removal of surplus water from the soil. This is accounted for by two features: (1) its rangy, deeply ramifying root system requires a commodious root zone for normal development and functioning; and (2) alfalfa uses enormous quantities of water, transpiring 80 per cent more than corn for each pound of dry matter produced. On a dry, hot July day as much as 20 tons of water per acre are consumed, while the average consumption for the growing season is 12 tons per day. To increase the depth of soil available to the root systems, the water table may need to be lowered. As a consequence, alfalfa will obtain more rather than less water.

Drainability Expresses Suitability

An appraisal of a soil with respect to drainage—either existing or intended—is all-important. The problem is simplified by grouping the several soil types of the state according to permeability. Four groups, representing levels of suitability for alfalfa production, result. These four groups of soils, graphically illustrated by figures 3, 4, 5, and 6, are identified as follows:

Of Prime Suitability.—Extensive areas of ideally suited soils exist in most counties of the state. They have highly and, usually, evenly colored subsoils, ranging from yellowish-brown, through brown, to reddish-brown, indicative of liberal aeration. A further characteristic is the gritty clay, sandy clay, or gravelly clay upper subsoil, and gravelly or sandy lower subsoil (Fig. 3). Over the rolling upland of western, of central, and, to a less extent, of eastern Ohio, soils of this make-up exist.

Equally typical of this group are the long stretches of terrace soils along streams. Pos-

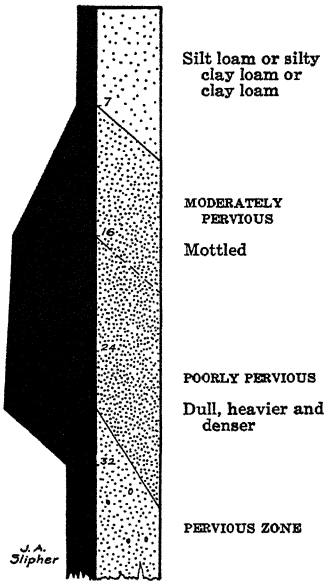


Fig. 5.—Graphic profile of soil group having "Marginal Suitability" for alfalfa. Width of black slab represents resistance to water movement.

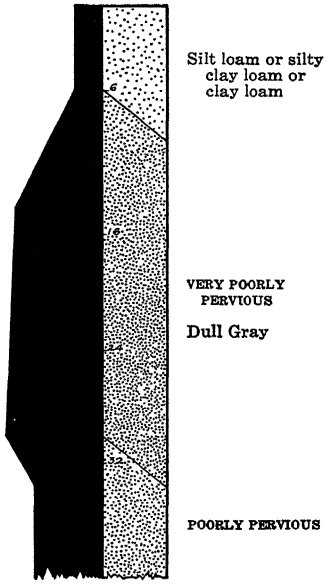


Fig. 6.—Graphic profile of soil group having "Unsatisfactory Suitability" for alfalfa. Resistance to water movement is pronounced at all subsoil levels.

sessing friable, permeable subsoils, with increasing openness in the lower subsoil, these lands need no, or only irregular tiling. Alfalfa is at its best on such soils.

Of Good Suitability.—To a second group belong those soils whose natural drainage falls a little short of that characterizing the "prime group." Members of this group show an increasing heaviness in the subsoil to a depth of 20 to 30 inches. Underneath this is a zone of less heavy texture and of noticeably friable nature (Fig. 4). In eastern Ohio, the brown and light brown surface soils with yellowish brown or mottled yellowish-brown compact upper subsoils, occupying rolling upland positions, belong to this group. Very dark gray to gray black soils (locally called "black" land), exclusive of the extremely heavy flat soils of northwestern Ohio, are extensive representatives of the sort. They are found on first bottoms or uplands.

A modest tiling program will bring this group to a par with the first group. Though possessing moderately heavy to heavy subsoils, their structure and permeability are such as to favor good vertical movement of water.

Of Marginal Suitability.—Of lower drainage efficiency are a great group of soils marked by a heavier, more mottled, upper subsoil and an even heavier, denser, middle subsoil nearly devoid of friability (Fig. 5). However, they have the same open, pebbly, friable under zone as the foregoing group.

Sufficient tiling for alfalfa is feasible on these soils. Obviously, spacing between tile lines will need to be narrower than in more suitable soils. (Table 1.)

Of Unsatisfactory Suitability.—A fourth group is characterized by a dull gray and uniformly dense subsoil to 30 inches and beyond (Fig. 6). In addition, the lower subsoil is extremely impervious. From most soils of this group water moves so slowly into tiles that the apparent effect of the tile is limited to a narrow strip.

Probably alfalfa alone has no place on this group of soils. The advantages of alfalfa-grass mixtures for such soils are discussed on page 12.

Schedule of Tiling for Alfalfa Land

For best results, a somewhat quicker removal of excess water from the soil is needed for alfalfa than suffices for corn. Experience has led to schedules of tiling similar to those in Table 1. For best functioning in these soils the tile lines should be placed in the pervious layer. No feasible amount of tile will render most soils of the fourth group suitable for alfalfa alone.

Table 1.—Spacing of Tile Lines for Alfalfa

Soil Group (See pages 4 and 5 for description)	Spacing of Tile Lines
Of prime suitability (Fig. 3)	Irregular
Of good suitability (Fig. 4)	8 to 6 rods
Of marginal suitability (Fig. 5)	5 to 3 rods

Soil Management for the Alfalfa Enterprise

Good drainage alone will not insure alfalfa. Four other soil factors make for success in growing it.

Besides Drainage, Alfalfa Requires

1. A sufficient supply of lime.
2. Liberal supply of mineral nutrients.
3. Nodule-forming organisms.
4. Tilth and dependable moisture supply in the seedbed.

Absence of any one of these factors will make the crop uncertain.

Meeting the Lime Need of Alfalfa

Through the ages, alfalfa has been identified with those regions of the earth having soils rich in lime.

Alfalfa Needs a Soil Reaction Near the Neutral Point.—Soil reactions are indicated by the *p*H scale, *p*H 7 being neutral, above *p*H 7 alkaline, and below *p*H 7 acid. *p*H 6 is slightly acid, *p*H 5 strongly acid, and *p*H 4.5 very strongly

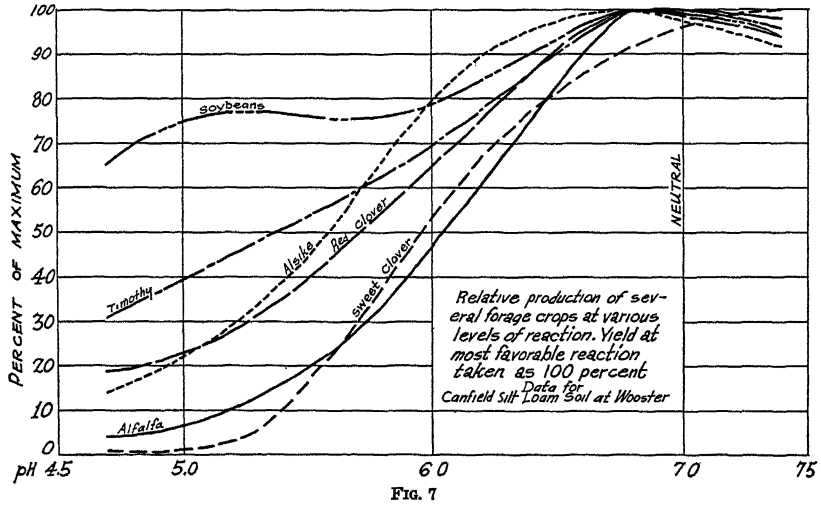


Fig. 7

acid. A reaction at or near the neutral point is most favorable for alfalfa as for most other crops (Fig. 7). When there is little lime in the subsoil, as at Wooster, even *p*H 6 is too acid for satisfactory crops of alfalfa, and *p*H 5 or below results in practical failure. On such soils, lime should be applied where the *p*H is below 6.5. Soils rich in organic matter (dark-colored) will yield well at a slightly lower *p*H than light-colored soils. Where soils have a lime layer at a depth of 18 to 36 inches, as in many extensive soil types of western Ohio, *p*H 6 is only slightly less favorable than *p*H 7, but *p*H 5 or below generally gives failure.

Alfalfa Is Greedy Consumer of Food Lime.—Standing out among legumes as a consumer of lime, alfalfa requires 50 pounds of food lime for every ton of dry hay. At this rate, the soil must deliver 150 pounds of lime oxide (equivalent to 300 pounds of lime carbonate) for a 3-ton yield (Fig. 8). On soils lean in lime, the crop may actually suffer for want of sufficient food lime.

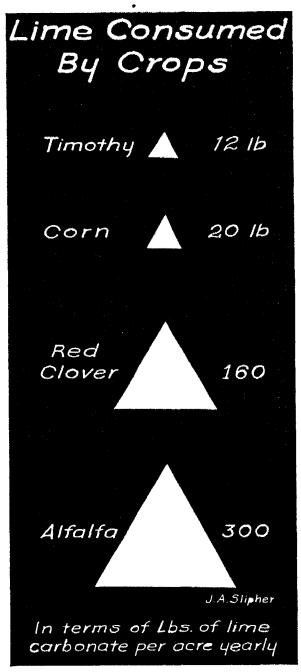


FIG. 8

Inoculation Conditional on Sufficient Lime.—The soil reactions which favor alfalfa also favor the root-nodule organisms of alfalfa. Where the surface is well limed, alfalfa roots will grow normally into subsoils as acid as *p*H 4.5 or *p*H 5, but no nodules are ever found on such roots.

How Much Lime?—The amount of lime needed to raise the soil reaction to *p*H 6.5 or above will vary with the degree of acidity and the soil type. In general, the heavier the soil, the more lime is required to change its *p*H a given amount. Amounts ranging from ½ ton to 6 tons per acre may be needed for successful alfalfa culture, with 1 to 3 tons as the more common range. Recommendations for specific fields can be obtained by sending to the Extension Service a representative sample from each type of soil within a field. Broadcast applications of liming material are best made several months or even a year ahead of the intended seeding. This is especially advisable where two or more tons of limestone are required.

Light Liming.—On those soils with a limy layer at 18 to 36 inches, but with acid surface soil, it is often possible to obtain a stand of alfalfa by neutralizing the surface soil in which the seedlings start, and so enable them to maintain themselves until their roots reach this lime layer. From 400 to 700 pounds per acre of hydrated lime or dry fine ground limestone are applied through the fertilizer attachment on a grain drill. When sowing in wheat, the seed and limestone are both conducted through the grain tubes to the shallow groove opened by the discs. When sowing in oats this will usually sow the seed too deep, and both are best sown on the surface of the ground. Light liming may also be used on previously limed soils which have again become slightly too acid to grow alfalfa or alfalfa-clover-grass mixtures. When sowing on strongly acid soils, a combination of light liming and the normal broadcast application, worked into the soil, is desirable.

By mixing the light application of lime with fertilizer at time of sowing, the two can be satisfactorily applied in one operation.

Fertilizing Alfalfa at Seeding Time

Fertilization of alfalfa at seeding time makes successful seedings more probable, raises the yield, and contributes to winter resistance. Experience and findings of tests support the practice on all but the stronger soils.

Bring Soil Up to Meet High Demands.—Though drawing a substantial quantity of mineral nutrients from the subsoil, alfalfa must depend upon the plow layer for a considerable portion of its supply. Young soils, or those liberally manured or fertilized in past years, may have accumulated a residual nutrient supply sufficient for starting the crop. However, on most soils fertilization at seeding time is essential for a high degree of success.

Manuring.—On soils of the marginal group (page 5), an application of 8 to 12 tons of farm manure per acre to the field to be sown to alfalfa, or even to the crop which precedes the alfalfa, often makes the difference between success and failure of the seeding. When alfalfa is seeded in wheat, 4 to 8 tons of manure may profitably be applied as a top-dressing on the winter wheat.

Fertilizing.—If a consistent manuring program has been carried out, then supplement it with commercial fertilizer as follows:

Situation 1. First or second bottoms, or sands.....0-14-6 (or 0-28-12).
Situation 2. Upland soils.....Superphosphate

Where manure has not been used regularly, mineral nutrients must largely be supplied from the fertilizer bag. Then the following program is applicable:

Situation 3. First or second bottoms, or sands.....0-12-12 (or 0-24-24)
Situation 4. Light colored silt loam upland or dark colored upland .....0-14-6 (or 0-28-12)
Situation 5. Light colored silty clay loam or clay upland.....Superphosphate.

Rate, Time, and Placement.—From 300 to 400 pounds an acre of standard strength fertilizer (or half as much of double strength) is an advisable rate. By reason of the high acre-value of the crop and the duration expected of the stand, a rate of less than 300 pounds is inadequate. With a fall-planted companion crop a portion or all of this fertilizer may be applied in connection with its planting, but it is preferable to apply part of it when the alfalfa is seeded.

These standard applications will normally carry the crop through two hay seasons. Thereafter, replacement by periodic top-dressings may be required as set forth on page 17.

Inoculation Indispensable

In starting alfalfa we are obliged to deal with a third measure—inoculation. By inoculation is meant the process of infecting the roots of the plant with nodule-forming bacteria. Putting land to alfalfa for the first time necessitates introducing its strain of bacteria.

How to Inoculate Alfalfa

Alfalfa may be effectively inoculated in one of the following ways:

Preceding Alfalfa with Sweet Clover.—It so happens that the same nodule bacteria serve both sweet clover and alfalfa. By preceding alfalfa with a sweet

clover crop that has been inoculated, thorough inoculation of the alfalfa usually results. This procedure is especially advisable for soil areas where experience shows that alfalfa "takes" reluctantly (see page 5).

Commercial Culture.—Reliable cultures are on the market at a cost equal to 10 to 15 cents an acre. They should be applied according to the specific directions accompanying each brand.

Inoculated Soil from Field.—Equally effective but less convenient is the use of soil from immediately around the roots of alfalfa or sweet clover with a good set of nodules. The soil may be dug in fall or winter, air-dried, and pulverized. After slightly moistening the seed with water or skim milk, 2 to 3 pints of the dry soil are thoroughly mixed with each bushel of seed. The soil will almost dry the seed, which should be sown at once.

The same conditions of moisture, lime, and mineral nutrient supply that favor a sustained growth of alfalfa, also favor longevity of the nodule bacteria in the soil. Under such conditions, reinoculation is unnecessary up to an interval of at least five years between crops.

Mechanics of Seedbed

Soil tilth exerts a controlling influence on the degree of success in seeding. Much of the hazard in getting a stand of alfalfa can be overcome by properly applied tillage. The problem is three-fold: (a) to gain shallow but complete coverage of seed, (b) to prevent drying of the soil beneath the roots of the seedlings, and in case of summer seeding, (c) to receive and move rainwater into the soil. These ends are accomplished by creating the right tilth, by the right tool, applied at the right time. Just how to adjust the tillage program to the several places, times, and methods of seeding is detailed on pages 13 to 16.

Choose an Adapted Variety

ALFALFA is not a one-variety crop. Numerous varieties and strains exhibit striking variations in inherent productive ability, hardiness at low temperatures, resistance to insects and diseases, rapidity of recovery after cutting, type of fall growth, color of flowers, and seed producing ability. Low yielding or non-hardy types are frequent causes for unsatisfactory results or failures attributed to other causes. Rapid increases in the acreages of alfalfa in the states east of the Mississippi followed the discovery and development of adapted strains and varieties. The problems are to know what kind is best and how to obtain seed of it.

Two Main Groups of Alfalfas—"Common" and "Variegated"

Blossom colors are the basis for classifying alfalfa varieties into two main groups: (1) common alfalfas; and (2) variegated alfalfas. The "common" alfalfas bear purple or violet blossoms. "Variegated" alfalfas take this name from the brownish-purple, greenish-yellow, yellow, gray or smoky, and whitish blooms that occur with the predominant purple blooms. While the common alfalfas vary notably in their ability to withstand low winter temperatures, the variegated varieties are more winter hardy than the average common alfalfa.

Common alfalfas are usually designated by the state or country in which the seed is produced; variegated alfalfas by the variety or strain name, to

which the state or province name is frequently added. Some illustrations of the designations are:

Common Alfalfas	*Variegated Alfalfas*
Dakota Common	Hardigan
Kansas Common	Ontario (or Canadian) Variegated
Utah Common	Grimm

The longer an alfalfa is grown in a specific region, the better adapted it becomes to that region. Since every so-called variety of alfalfa is cross-pollinated, it contains many varying types. By natural selection the non-adapted types are gradually eliminated. The best alfalfas are those that have been grown for a number of years under natural conditions at least as severe as those existing where the seed is to be sown. Hence, when obtainable, Ohio-grown seed is to be preferred. In recent years production of alfalfa seed has markedly increased in Ohio. The wider use of variegated varieties that set seed more abundantly, wider experience in handling the seed crop, and dry seasons, have been responsible for these increases.

Shall We Use Variegated or Common?

The performance of an alfalfa variety on Ohio farms is determined primarily by yielding ability and winter hardiness. With the possible exception of the bottom lands of southern Ohio, the variegated varieties have rather consistently yielded more and been hardier than any of the common alfalfas. At Columbus and Wooster, variegated alfalfas have outyielded the northern commons by an average of 5 to 7 per cent, and at the Northwestern Experiment Farm in Henry County by about 15 per cent, in the first hay year. Winter killing has not been the differential factor in these comparisons; the differences were due to greater inherent yielding ability of the variegated types and their apparent greater resistance to all types of "yellowing."

Variegateds and northern commons live over most Ohio winters equally well. But in an occasional winter, like that of 1923-24 at Columbus, the commons will kill out while the variegateds survive. Low temperatures of the winter of 1932-33 and excessive water during April and early May of 1933 reduced the stands and vigor of the common alfalfas much more than of the variegated alfalfas in northwestern Ohio. The extra cost per acre for seed of variegated alfalfas is inexpensive insurance against such dangers.

Table 2.—The Right Alfalfa in the Right Situation

Location and Desired Length of Stand		Soil Group (See Page 4.)	
		"Prime group"	The other groups
Northern Ohio	Long—more than 2 years...	Variegated	Variegated
	Short—1 or 2 years.....	Variegated	Variegated
Middle Ohio	Long—more than 2 years...	Variegated	Variegated
	Short—1 or 2 years.....	Adapted common	Variegated or adapted common
Southern Ohio	Long—more than 2 years...	Adapted common	Adapted common or variegated
	Short—1 or 2 years.....	Adapted common	Adapted common

The longer one wishes alfalfa to remain, the farther north in the state one lives, or the less favorable the soil, the greater the chances of worth-while differences in favor of the variegated alfalfas (Table 2).

What Variegated Varieties Are Preferred?—Grimm is the standard variegated variety. Varietal and strain comparisons in Ohio indicate a slight preference for Hardigan, a relatively new variety developed by the Michigan Agricultural Experiment Station, and Ontario Variegated, over Grimm.

From What Areas Are the Best Common Alfalfas Obtained?—Ohio-grown seed is to be preferred. Little difference has been exhibited in Ohio between the common alfalfas from Kansas and the more northern states. Those from the Dakotas or Montana may be expected to be hardier than those from farther south. Frequently common alfalfas from the northern states show some mixture of variegated alfalfa. Kansas common has been more satisfactory than Utah common. Alfalfa from seed produced in the states south and southwest of Kansas is notably non-hardy in Ohio. Imported seed from Argentine, Turkestan, and all other countries, except Canada, is poorly adapted.

The "Branching Root System" Tradition of Grimm a Myth.—There are greater differences in the root systems of any alfalfa grown on different soil types than between those of Grimm (or other variegated alfalfas) and common alfalfa grown on the same soil. The root systems of Grimm and the common alfalfas a year old or less are indistinguishable. Old established plants of Grimm sometimes show slight differences from those of common, not so much in the branching of roots as in the slightly greater number of fibrous roots.

The farmer who wishes to know whether or not he actually sowed a variegated alfalfa, must rely upon the occurrence of numerous variegated flowers to identify the plants as those of variegated alfalfa. Variegated alfalfas also tend to cease top growth and become dormant earlier in the fall.

Purchasing Proven-origin, Adapted Seed

In buying seed, variety and origin are prime considerations. It becomes an important matter to know how one may secure what he asks for.

"Certified" or "Registered" alfalfa seed is available in sealed bags from producers operating under the inspection and supervision of several state seed improvement associations. Such seed is guaranteed as to variety, purity, germination, as well as to origin.

The Ohio seed law specifies that the name of the state, province, or country of origin shall be on each lot of alfalfa seed sold in Ohio. Since 1927 the United States Department of Agriculture has operated a seed verification service, through which it issues to cooperating seed dealers certificates of origin—designating the state where grown—of domestic lots of alfalfa seed which can be traced directly to the grower or country shipper. The purchaser of U. S. "Verified-Origin" alfalfa seed has an assurance of its place of production. However, the U. S. Verified-Origin certificate guarantees nothing as to adaptation, variety, purity, or germination.

All alfalfa seed imported into this country is officially stained. Seed that is considered unadapted for general use in the United States is stained 10 per cent red. Seed of limited or undetermined adaptation is stained 1 per cent green. One per cent of the seed in lots from Canada only is stained violet. Seed of Ontario or Canadian Variegated produced in Canada will always have this characteristic identification mark.

Using Alfalfa in Mixtures

ALFALFA should be more widely used as a component of seeding mixtures. Quality and yield of hay or pasture will be raised; succeeding crops benefited; the life of some meadows lengthened; and the way paved for a larger proportion of alfalfa in later seedings.

Working into Alfalfa.—On many fields now growing medium red clover successfully, the introduction of alfalfa into the seeding results in a surprising number of productive alfalfa plants. A good initial mixture to try is 4 pounds of alfalfa, 4 pounds of red clover, 2 pounds of alsike, and 4 pounds of timothy. If the timothy is sown in the fall, 2 pounds are ample; more results in a lessened percentage of legumes in the hay. As the soil conditions improve the proportion of alfalfa may be increased, that of clovers reduced. Inoculation of the alfalfa seed used in mixtures should not be overlooked.

Protective Action of Grasses.—Not only may alfalfa be a valuable component of mixtures, but especially on the "marginal" and "unsatisfactory" soil groups, certain grasses may often be included with the alfalfa seeding to the advantage of the alfalfa. At the Trumbull County Experiment Farm, on heavy textured soils difficult of drainage, even though adequately limed, alfalfa alone could not be successfully grown However, mixtures of alfalfa and timothy are there giving long-lived meadows that average 3½ to 5 tons of highest quality mixed hay per season. The fibrous roots and fall growth of the timothy lessen the heaving action of the soil.

Alfalfa-Grass Mixtures.—Alfalfa-grass mixtures generally outyield pure alfalfa. They are conspicuously freer from weeds than pure alfalfa. The mixed hays cure somewhat more readily. The second and third cuttings each season are predominantly of alfalfa. In northern Ohio, timothy is probably the best grass to use with alfalfa. In middle and southern Ohio, orchard grass-alfalfa mixtures have been outstanding in yield. In southern Ohio the orchard grass survives early cutting better than does timothy. Two pounds of timothy, if fall sown, 4 if spring sown, and 5 to 8 pounds of orchard grass spring sown are used with the normal amount of alfalfa seed.

Making the Seeding Safe

ESTABLISHING a seeding is beset with risks, even on adapted soils. They may be great or small depending upon the deliberate attention given to: rate of seeding; choice and management of companion or nurse crop; manipulation of the soil; devices for seeding; placement of seed; critical factors of frost, moisture, and weeds; and time of seeding.

Rate of Seeding

A new seeding with 20 plants per square foot has an adequate stand. Since 1 pound of alfalfa seed contains approximately 220,000 seeds, 5 pounds of seed per acre result in an average of 25 seeds per square foot (Fig. 9). If each seed developed into a plant, an excellent stand might be secured with only 5 pounds of seed per acre. However, some seeds are sown too deep, some too shallow, others do not germinate, and a high death rate among young seedlings may occur.

The recommended standard rate is 10 to 12 pounds per acre of adapted seed of high germination. The quantity of seed necessary for a good stand varies with the viability of the seed, the type of soil, the condition of the seed-

bed, and the manner of seeding. Eight pounds are as little as should be risked even under the most favorable conditions, while if 15 pounds do not give a satisfactory stand, the trouble is elsewhere. Within these limits, the more favorable the conditions for seeding, the lower the rate may be. The rate of seeding apparently has no influence on the percentage of leaves in the hay.

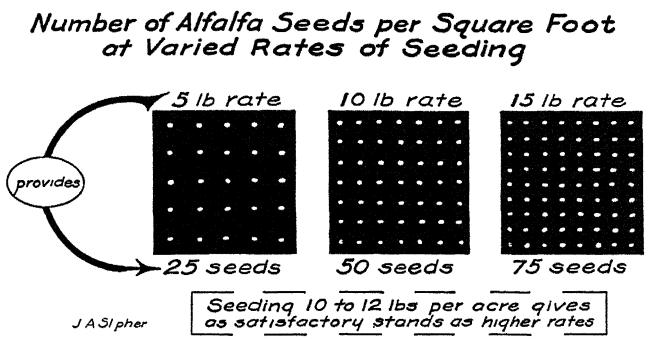


FIG. 9

FACTORS FOR EVALUATING SEEDING METHODS

1. *Freezing Danger.*—Young seedlings of alfalfa are sensitive to freezing temperatures. Hence, proper timing and coverage of early spring seedings are essential.

2. *Soil Moisture.*—Moisture must be sufficiently abundant and usable to enable the seed to germinate, and the seedling to become established. The necessity for moisture often conditions the manner of seedbed preparation.

3. *Seed Coverage.*—Prompt, complete, but shallow embedding of the seed in the moist soil assures germination. The greater the natural looseness of the soil, the deeper the coverage should be within limits of ¼ to 1 inch. Deep seeding is to be avoided, as is shallow seeding which may result in freezing or drying (Fig. 10).

4. *Competition.*—Companion crops or weeds compete with the alfalfa seedlings for light, moisture, and nutrients. The young seedlings do not thrive in shade. Companion crops or weeds that over-cover the alfalfa with a dense growth may be disastrous. Relief from critical competition is to be sought through lighter planting rates, earlier maturing varieties, and earlier harvesting of companion crops, or through seeding without a companion crop.

5. *Opportunity for Storage of Reserve Food.*—Before the onset of freezing weather in the fall, there must be opportunity for the alfalfa to store up in the roots food reserves that will enable it to withstand the winter.

SEEDING WITH OR WITHOUT A COMPANION CROP?

Companion or nurse crops are used: (1) to obtain some return from the land in the seeding year; (2) to check the growth of a more injurious companion crop of weeds; and (3) to prevent erosion. Companion crops requiring harvest are not *directly* beneficial to alfalfa or other legume seedings.

Conversely, seeding alone does away with harvesting a companion crop and avoids too severe competition, if weed growth can be avoided. On rich soils high in nitrogen, the excessive shade of the companion crop may easily kill the alfalfa seedlings. On sandy soils and "drouthy" clays the competition for the limited moisture is so keen that companion crops are frequently inadvisable.

Seeding With a Companion Crop

1. *With Spring Sown Winter Wheat.*—Three or four pecks of winter wheat sown in the spring provide an excellent companion crop. Sown at this time, winter wheat does not form heads, makes only a short growth, and dies out by late summer. It checks weed growth until the alfalfa is well established. There is no companion crop to remove and in favorable seasons one crop of alfalfa hay may result. However, on very fertile soils, even this companion crop may grow so densely as to kill the alfalfa seedlings.

2. *With Peas for Canning.*—Early planting and early removal rank canning peas high as a companion crop for alfalfa seedlings.

3. *With Barley or Oats.*—Because of their short growth and early harvests, barley and early oats, seeded at light rates, are the most generally satisfactory companion crops in which to make alfalfa seedings. Due to their heavier shade and longer competition with the alfalfa, late varieties of oats do not rank high as companion crops.

4. *With Fall Sown Winter Wheat.*—If sown on winter wheat, alfalfa must compete from the day of seeding with completely established and rapidly growing wheat plants, while with spring sown companion crops it starts on even terms. Time and manner of seeding are critical factors with seedings on winter wheat. Too early seeding may lead to freezing injury to the young seedlings; while late seeding assures severe competition from the wheat plants. At Columbus the best stands have been obtained from seedings made March 20 to April 1—these dates would be no more than a week earlier in southern and a week later in northern Ohio.

More consistent success in seeding with wheat has been obtained by splitting the seeding—half of the seed broadcasted about March 10 and the other half seeded with a drill about April 1.

5. *With Corn.*—Summer seedings at the last cultivation of corn are most uncertain, though alfalfa does better than any of the clovers seeded in corn. Seedings in corn should be chanced only on the "prime group" of soils under conditions of plentiful soil moisture.

Seeding Without a Companion Crop

1. *Seeding Alone in Early Spring.*—If sown in late March or early April on a fall-plowed, well-settled, fairly weed-free seedbed, alfalfa will make a good growth before most annual weeds start to grow. Moisture conditions then are generally favorable for starting and continued growth. Stands and root systems will be superior to those obtained in summer seedings. At least one hay crop may be removed in favorable seasons.

2. *Seeding Alone in the Summer.*—The success of summer seedings depends principally on satisfactory moisture relations. Early plowing and periodic discing, to firm the plow layer, to kill several crops of summer weeds, and to establish moisture connections between the surface and subsoil are required. Then the seeding should be made as soon after July 1 as there has been stored in the soil sufficient moisture to keep the seedlings growing. If the lower part of the surface soil is moist, the seed should be sown without waiting for another rain.

At the start of winter the root system of summer sown alfalfa will be smaller and shallower than that of spring seedings. Therefore, seeding after

August 15 to September 1 is risky because of lack of opportunity for root development. While weeds can be effectively controlled by the preceding fallowing, summer seeding requires more labor for seedbed preparation and may mean the loss of return on the field for the year of seeding.

Attempting a seeding after the removal of a small grain crop is risky, because that crop has so reduced the soil moisture that above normal rainfall is needed not only to start the alfalfa, but to keep it growing. In such situations, through disking will not so adversely affect the moisture relations in the soil as will plowing.

3. *Seeding Alone in May or June* INVITES WEEDS.—Seedings made alone in May and June have less chance of success because of the almost inevitable and rapid weed growth during that period.

PLACING THE SEED IN THE SOIL

Alfalfa seed should be placed *on* firm soil, covered, but not too deeply. When sowing in wheat on settled soils the problem is to obtain coverage; on newly prepared, loose soils, the problem is to avoid too deep coverage. To effect the proper and even placement of seed in the soil the most satisfactory tool is the grass-seed drill. Even this may cover too deeply on loose soils. Somewhat less seed is adequate where such a drill is used.

FIG. 10.—Cultipacking this ground after drilling covered the seed, doubling the stand.

When sowing alfalfa from the seeder box of a grain drill on winter wheat, growing on settled light-colored soils, the seed should go through the grain tubes. Under these conditions, even harrowing or cultipacking may be desirable to cover the seed in the shallow furrows (Fig. 10). When sowing broadcast on winter wheat, freezing and thawing and rains of early spring will usually cover the seed on loose soils. As the soil dries slowly at this time, even seeds on moist surfaces may germinate and establish themselves.

To avoid too deep coverage in seeding alfalfa with spring grains on a newly prepared seedbed, the grass-seed tubes of the grain drill should be lengthened and tied back so that the alfalfa seed will fall back of the discs, rather than in front of them or through the grain tubes.

An especially desirable system of making summer seedings, or seedings on well prepared land at any time, is: first, cultipack; second, broadcast the seed; third, harrow lightly crosswise. The seed falls on firm, moist soil in the cultipacker furrows, is uniformly covered, and germinates in rows as though it were drilled.

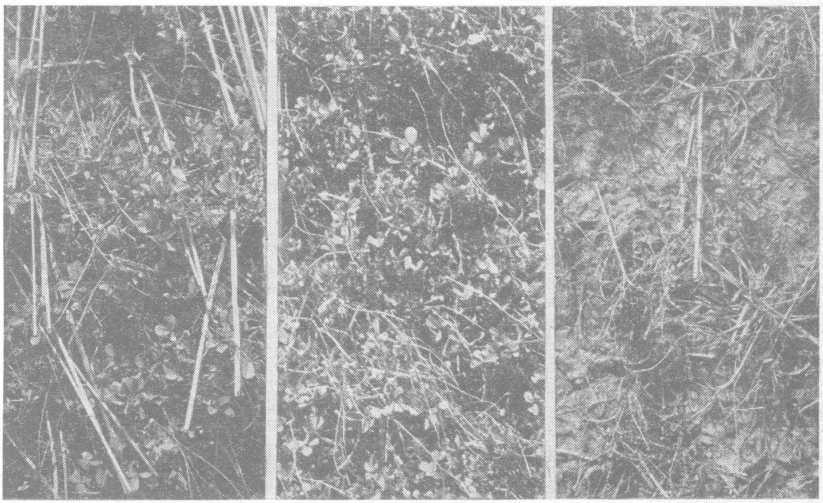
Management of Alfalfa Meadows

EVEN the best new seedings of alfalfa become successful meadows only when properly managed. The manner and timeliness of management operations finally determine the quality and quantity of the forage, and the permanence of the stand.

Clipping New Seedings

Summer Seedings Should Not be Clipped.—Alfalfa plants started in the summer have little time before winter to store food reserves in their roots. If they are cut, the storing of food is interrupted, and the clipped plants may not be able to live through the winter.

Spring Seedings May Be Clipped Before September.—Clipping spring-sown seedings before September 1 is not detrimental to the stand; later clippings may be (Fig. 11). Under favorable soil and climatic conditions, a spring-



Not clipped | Clipped Aug. 1 | Clipped Nov. 1

Fig. 11.—Appearance of stands in April following clipping. Clipping early (before Sept. 1) is not harmful; late clipping may be.

sown seeding may produce enough hay by late August to justify its removal. Whether this is true or not, clipping results in higher quality hay the next year by reason of removing stubble and weeds.

The cutter bar should be set low so as to cut under the branches of the weeds. Since the regrowth of the alfalfa comes from vigorous buds on the crowns—not on the clipped stems—low clipping is not injurious. High clipping favors the weeds and not the alfalfa.

Can a Thin Stand Be Reseeded?

Attempts to thicken up thin alfalfa stands by reseeding them with alfalfa have been unsuccessful, even though tried under the most favorable conditions. The old alfalfa plants, though sparse, prove too severe competitors for young seedlings. A promising plan for continuing the usefulness of a thin alfalfa meadow is to drill in timothy seed immediately after the last cutting.

Top-Dressing Established Alfalfa

Manuring the Young Stand.—A dressing of four to eight loads of manure on the young seeding soon after removal of the grain crop proves helpful. It supplies needed potash and phosphorus which are carried by rainfall into the soil. In addition, the nitrogen in manure proves helpful to the grass in grass-alfalfa seedings. On the physical side, the straw or other solid substance of manure retards the evaporation of soil water. This mulching effect saves some of the moisture from the occasional rains during the usually critical dry period after harvest. For these topdressings, relatively weed-free manure should be spread evenly, preferably by machine.

Fertilizing the Producing Stand.—The most important place to apply fertilizers to alfalfa is at seeding time (page 8). However, since large amounts of potash and phosphorus are removed in the hay, these mineral nutrients may need to be periodically replaced. Hence, to maintain high production, the following topdressings are suggested for the beginning of the third hay year and every second year thereafter during the life of the meadow.

Situation 1.	First or second bottoms, or sands	0-12-12 (or 0-24-24)
Situation 2.	Light colored silt loam upland or dark colored upland	0-14-6 (or 0-28-12)
Situation 3.	Light colored heavy upland	Superphosphate
Situation 4.	Upland exceptionally strong due to heavy manurial or fertilization program in past or to native richness	None

The most effective placement is to imbed the fertilizer with a grain drill; the best time to apply is early spring; the rate, 200 to 300 pounds. On the heavy soils, fall or early winter topdressings of 6 to 8 tons of manure, reinforced with 150 to 250 pounds of superphosphate, will aid in maintaining yields and lower the danger of losses of stand by "heaving."

A Covering for the Winter.—Spots prone to severe "heaving" or areas disposed to other winter damage are effectively protected by a covering of coarse material over the winter. Weed-free soybean or other straws and strawy manure are excellent materials for the purpose, which is to insulate the soil against a fluctuating temperature. Applying 2 to 3 tons per acre after growth ceases before the onset of winter is advisable.

Should We Cultivate Alfalfa?

Cultivation has no favorable effect on yield. Ridding the stand of weeds and bluegrass is the sole benefit. Unless this is accomplished, cultivation is a waste of effort. In fields infected with alfalfa wilt, positive harm results from cultivation, due to spreading the disease.

To be effective in removing weeds, cultivation is best done after one of the cuttings if and when the soil is fit to work. As to choice of implements, a spring tooth harrow with narrow teeth is the best; the disc, the worst. The latter splits and injures the crowns, actually reducing the stand rather than thickening it.

Fitting crops to the inherent capabilities of soil and farm is the keynote of a new order. This means for Ohio, the more effective use of forage crops—whether they be timothy, the clovers, mixtures, or alfalfa.

Quality and quantity of forage and the permanence of stands are notably affected by the cutting system adopted.

How Many Cuttings per Season?

Three cuttings per season properly distributed are generally the best practice.

Yield of Hay and Permanence of Stand.—In a 7-year comparison at Columbus, a three-cutting system has given nearly a ton more hay per season than the best two-cutting system (Fig. 12). Shorter tests elsewhere in the state fully substantiate this finding. Four cuttings have slightly outyielded three cuttings only in the first hay year. Thereafter, the total harvest from four cuttings has been less than from three cuttings, since the regular removal of four cuttings lessens the storage of reserve food in the roots and leads to winter-killing and slow recovery after cutting. In point of permanence of stand, the three-cutting system has proved superior to the four and equal to the two-cutting system. Therefore, on the joint bases of yield of hay and permanence of stand, the evidence clearly favors three cuttings per season.

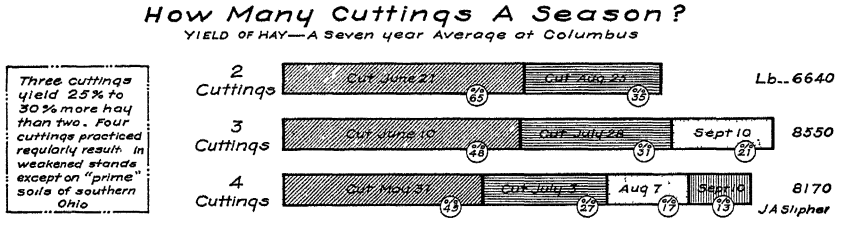


Fig. 12

Quality of Forage and Yield of Protein.—The earlier cuttings are made the higher the percentage and the digestibility of the protein. Three cuttings may be expected to produce 40 per cent more pounds of protein, of higher digestibility, than where two cuttings are removed (Fig. 13). In the four-cutting system, the percentages and total amount of protein per acre are slightly higher than with three cuttings. However, the later cuttings may be so small in dry years that difficulty will be experienced in raking them cleanly.

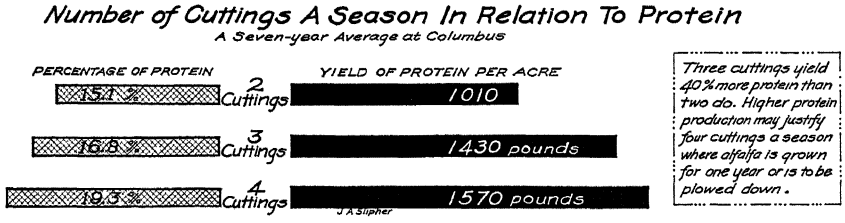


Fig. 13

Exceptions to the Three-Cutting Rule.—(1) Four cuttings are justified on the "prime" alfalfa soils of the southern third of Ohio where the longest growing season prevails. There, four cuttings will outyield three in hay as well as in protein, and stands will be maintained satisfactorily if the cuttings are properly distributed (Table 3). (2) Elsewhere, taking a fourth cutting is per-

missible if the stand it to be plowed down. (3) In extreme northeastern Ohio, two cuttings may be advisable in years of short growth or where the third cutting would have to be made much after September 1.

When Shall the Cuttings Be Made?

Extensive experiments in Ohio on time and number of cuttings have demonstrated that a system of calendar dates, carefully interpreted for seasonal weather conditions, is more satisfactory than any other system for determining when to make the various cuttings. These dates have been determined with relation to yield and quality of the hay, and permanence of the stand. In Table 3 are the suggested generalized dates for major sections of Ohio. Weather, soil conditions, and elevation will necessitate slight variations.

Table 3.—Cut Alfalfa by This Calendar

Section of Ohio	First cutting	Second cutting	Third cutting	Fourth cutting
Southern third—1st & 2nd "bottoms".	May 28 to June 4	June 28 to July 5	Aug. 3-10	Sept. 8-15
Southern third—uplands	June 3-10	July 20-27	Sept. 3-15	
Middle third.....	June 7-14	July 20-27	Sept. 3-10	
Northwest	June 7-14	July 20-27	Sept. 1-7	
Northeast	June 9-16	July 20-27	Sept. 1-7	

The First Cutting.—Since the first cutting in a three-cutting system normally yields 45 to 50 per cent of the season's total crop (Fig. 12), the time of making this cutting is extremely important. Weekly harvests show that the yield rises until mid-June, and thereafter remains fairly constant (Fig. 14).

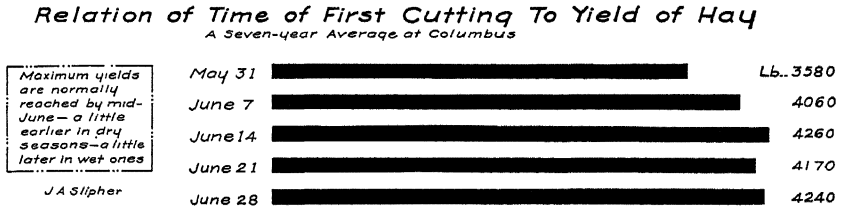


Fig. 14

Parallel with the rise in yield is a decrease in protein percentage, amounting to 0.2 per cent per day during the first two weeks of June (Fig. 15). The max-

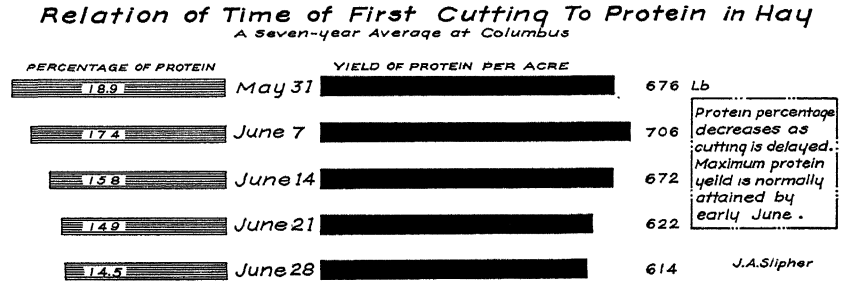


Fig. 15

imum quantity of protein per acre is normally reached within the first ten days of June. Hence, yields of hay and protein indicate that the first cutting should be made during the second week of June (Table 3). In dry seasons the first cutting may be made earlier, in wet seasons later than the suggested dates. High-quality hay can be obtained if the first cutting is made as early as June 1, but the 10 to 15 per cent lower yield is not normally made up in the later cuttings.

Several other criteria have been considered for determining the time of cutting. Among them are:

Cessation of Growth.—Alfalfa reaching the point of maximum yield indicated in Fig. 14, seems to "stand still" and a slight yellowing usually appears. At this time, or a little earlier, is an excellent time to cut.

Stage of Bloom.—Particularly with common alfalfa, the stage of bloom is often difficult to determine in humid climates. As an index of cutting, the stage of bloom is no more satisfactory than the system of suggested calendar dates (Table 3). At Columbus, alfalfa normally is 1/10 to 1/2 in bloom by June 7, and reaches full bloom about one week later. Cutting should not start before blooming begins, but should be well under way at the half-bloom stage and completed by full bloom.

Shoots at the Crowns.—Neither the presence nor the absence of shoots at the crowns has any bearing on the proper time to cut. Their appearance is governed largely by conditions of shade and soil moisture rather than by maturity of the alfalfa plant. Alfalfa is not injured by cutting these shoots even if they are tall enough to be cut at harvest time.

The Second Cutting.—This cutting is the most difficult one to time accurately. Stunted growth and premature blooming, due to drouth, or severe "yellowing," due to the attacks of the potato leaf hopper, may tempt one to cut before the suggested dates (Table 3). This should not be done unless a heavy, deeply penetrating rain occurs. Then the stunted or yellowed growth should be promptly removed to encourage vigorous new growth. If the second growth is heavy and not stunted, but "yellowing" starts prior to the suggested dates, it is advisable to cut at once and risk the occurrence of "yellowing" in the normally smaller third cutting. When the second cutting is delayed until the suggested dates, the third growth will seldom be more than slightly yellowed.

Where adjacent areas of second growth alfalfa are cut a week or more apart, the border of the early cut area may be seriously yellowed and stunted in the third growth, because of the attacks of the leaf hoppers that migrated from the later cut area to the tender new shoots immediately adjacent. If the early cut strip consists of only a few swaths, the alfalfa on it may be killed by the attack.

Last Cutting—The Third (or Fourth).—The final cutting of alfalfa should be made by the last date indicated in September, so as to afford sufficient time for fall growth. A good top growth in the fall enables the plants to manufacture abundant food for storage in their roots before winter. Cutting later may be weakening or disastrous to the stand (Fig. 16). Delayed cutting or late pasturing is advisable only when the meadow is to be plowed.

Cut the Stems Low.—Alfalfa should be cut short. Long stubble, left in careless mowing, appears as foreign material in the next crop. Low cutting does not injure alfalfa, for new stems always come from the buds on the crowns—not from the buds on old stems.

Speed and economy of operations are the watchwords in the alfalfa hay field. Speed is essential if one would take full advantage of any and all the hay curing weather.

Save the Leaves.—Preservation of the maximum amount of leafiness characterizes the art of making quality hay. One pound of leaves contains twice as much protein as one pound of stems—23.4 per cent and 12.2 per cent respectively in 51 comparisons at Columbus. Furthermore, the proteins of the leaves are of higher digestibility.

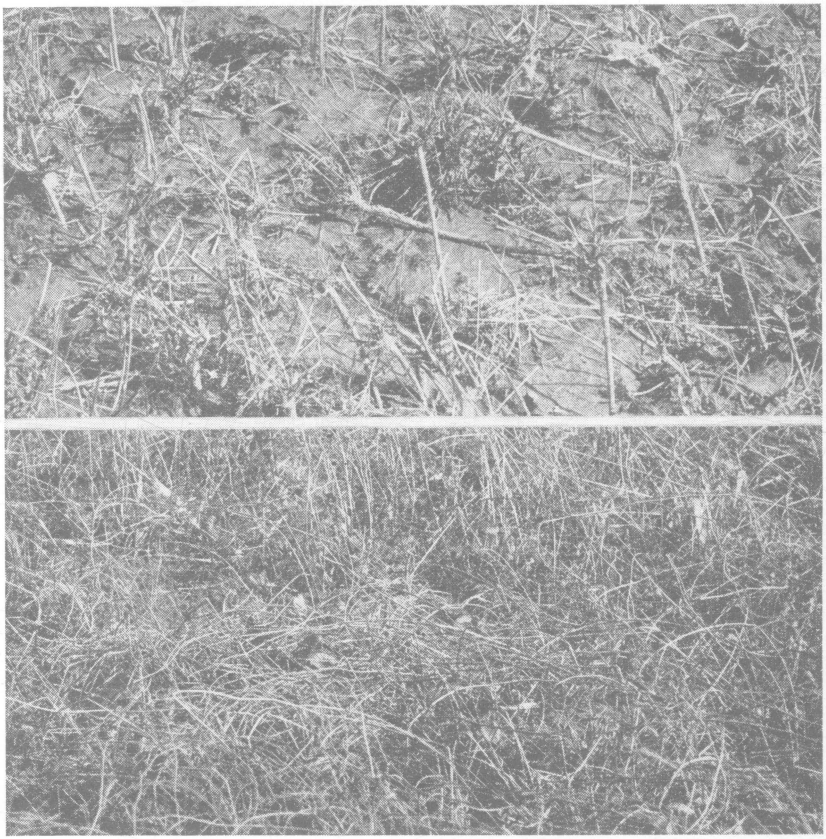


FIG. 16.—Late fall cutting may be disastrous. Upper—Cut mid-October; Lower—cut in August. Pictures give appearance in following April.

Swath, Windrow, or Cock?—Under careful management high grade hay can be made in cocks, but the procedure is slow and laborious. Curing entirely in the swath leads to severe bleaching, uneven curing, a heavy loss of leaves, and serious losses from leaching in event of rain. Curing in the windrow is speedier, more economical, and, if properly conducted, will result in more high-grade hay than any other method.

Curing Procedure.—Alfalfa cut in the morning is normally ready to put in the windrow the same day. If first wilted in the swath—but raked before

any leaves are brittle—hay will cure more rapidly and more uniformly in small windrows than in swaths. Also, dews would bleach wilted hays left in the swath overnight. On the following morning, the windrow should be turned over onto dry ground as soon as the top and sides have thoroughly dried. Second and third cutting hay may often, and first cutting occasionally, be stored that afternoon. When heavy first cutting hay is not dry enough to store this second day, the windrow may be turned again the morning of the third day to speed the drying process.

When rain interferes, the top of the windrow and the soil is permitted to dry, and then the windrow is turned exactly upside down with the rake. About one-fifth as much rain reaches the same amount of hay in the windrow as when it is in the swath. Not only do windrows expose less surface than swaths to sun, dews, and rains, but drying air moves through the windrowed hay more readily than through hay in the swath.

Choice of Implements.—A side delivery rake is the haymaker's best aid to speedy curing. It rakes all the hay. With it small uniform windrows can easily be made, and turning of windrows is quickly accomplished. A dump rake does not lift all the hay from the ground. Making small windrows with it is possible but laborious. Dump-rake windrows may be turned by reversing the direction of raking. The push-arm type of loader threshes the leaves badly. A web loader will not waste as many leaves as pitching the hay by hand.

To Preserve Maximum Leafiness, the Skilled Haymaker Will:

Avoid overdrying and weathering in the swath.
Avoid too large windrows.
Avoid using the rake or tedder when the hay is brittle.

Artificial Drying

Food values in hay can be largely preserved by artificial drying. The costs of equipment and its operation prohibit the use of this method of curing except perhaps on a few farms with large alfalfa acreages and with special outlets for the dried material at premium prices.

Storing the Hay

Mow-burning and spontaneous combustion are ever-present worries during and after hay making.

Mow-burning.—Mow-burning occurs most frequently through the center of the mow. Several schemes are used successfully to prevent excess pressure and consequent browning in the center of the mow. Where barn construction and elevating and carrier equipment make it possible to release the hay from the fork or sling without elevating it first to the peak of the roof, the distance of fall may be shortened. One or two poles, raised a few feet above the hay in the mow, will break the fall of the hay and aid in its even distribution. Careful separation and distribution of each fork or sling load over the mow is especially important in lessening the danger of browning.

Spontaneous Combustion.—Hays bearing loose moisture from rain or dew tend to develop higher temperatures in storage than those with a similar amount of natural moisture only. Mows that contain different lots of hay varying in moisture content are far more apt to heat dangerously than mows with a higher but uniform moisture content. The more variable the moisture content of the different lots of hay in a mow, the greater the likelihood that

the right combination of oxygen, moisture, and temperature will occur to start spontaneous combustion.

Salting Hay.—There may be a few cases where salting will reduce fermentation and molding, but the available evidence indicates that ordinary salting of hay does no more than add seasoning.

Chopping Hay.—By chopping the hay and blowing it into mows, two to three times as many tons can be stored in a given space as of the usual long hay. However, chopped hay of the same moisture content will develop higher temperatures in storage than long hay. Hence, hay to be chopped should be at least as dry and probably drier than long hay that is safe to put in the mow.

Baling Alfalfa Hay

TO preserve the leaves and to avoid bales with "stemmy" surfaces, stored hay whenever possible should be baled on damp days. Baling from the mow or stack just as the hay is "coming out of the sweat" results in soft hay with clinging leaves.

Baling directly from the windrow, if practical, would reduce the handling costs on large acreages of hay. However, hay must be decidedly drier to be field-baled than to go safely into mows or stacks. Windrow baled hay is apt to mold unless it is extremely dry, and the bales loosely stacked. It is doubtful if this method can be successfully used in Ohio except on large acreages as a supplement to other methods.

Marketing Alfalfa

THERE is no satisfactory consumer demand for low-grade alfalfa hay. Such hay is best marketed through livestock fed on the farm. However, quality determines the actual feeding value whatever the method of marketing. Hence, standards for grading alfalfa hay should reflect the feeding values. This is just what the official hay grades of the U. S. Department of Agriculture seek to do. In this system grade is determined by: (1) per cent by weight of leaves; (2) relative degree of green color; (3) amount of foreign material; and (4) condition of the hay.

QUALITY IN ALFALFA HAY is measured by:

Leafiness.—One pound of leaves has twice as much protein as one pound of stems.

Color.—The degree of "greenness" reflects maturity, and type and extent of weathering. It also indicates the content of vitamin A.

Foreign Material.—Weeds, stubble, sticks, and the like, lower the feeding value.

Condition.—High-grade hay must be "sweet and sound"—not moldy, moist, or heating.

High-grade alfalfa hay from Ohio compares very favorably on the market with hay from other areas. However, the Ohio producer has not received merited premiums for high-grade hay. A reputation for quality needs to be established; marketing methods need to be simplified.

Producers, dealers and consumers will have to use quality-describing terms and grading methods that are capable of accurate interpretation by all. "Plugging" of cars—best bales at the doors, poorer hay hidden in the ends of the cars—is perhaps the worst fault found with hay shipments from Ohio.

Pasturing Alfalfa

THE effect of pasturing is similar to frequent cutting in that it tends to exhaust the root reserves and weaken the plants. Skillful management is required if alfalfa is not to be killed by pasturing.

Pasturing with Swine.—Alfalfa is perhaps the best pasture available to the Ohio hog raiser, because of its palatability and season-long availability. If stocked so lightly—say 800 pounds of swine per acre—as to permit taking one or two cuttings of hay, the stand may be maintained longer.

Pasturing with Cattle.—Except in dry climates or seasons, continuous pasturing with cattle seriously injures the stand. A most practical possibility is to pasture the second growth to supplement the regular pasture at its usual low ebb in July and August. Anticipating this, the first cutting should preferably be made somewhat later than previously suggested for haying. If the alfalfa is pastured at or near its carrying capacity during July and August no further removal of hay is to be made. As with haying, pasturing after September 7 to 15 is at the risk of injury to the stand.

Bloat.—This is an ever-present hazard in pasturing cattle or sheep on alfalfa. The precautions are simple: First, the animals should be full of feed—not hungry—when first "turned in." Secondly, once grazing has started, keep the animals on the alfalfa constantly. Ready access to a constant supply of water and salt is also advisable.

Alfalfa Seed Production in Ohio

BEGINNING with 1930 an increasing number of growers in western Ohio have harvested alfalfa seed. Yields of ½ bushel to 6 bushels, with an average of 2 to 3 bushels, have been obtained.

Thin stands, together with abundant sunshine and low rainfall during blooming, seem to favor seed production. Variegated varieties are more sure seed producers than the common alfalfas. Higher yields and quality of seed result when the second, rather than the third growth, is left for seed.

Three-fourths of the seed pods should be brownish-black at harvest time. The mower with a buncher attachment, used when the plants are tough, shatters less seed than other harvesting machines. The seed crop cures rapidly if left in small bunches. Since the seed is readily injured by rain, and shatters easily, storage in the barn or a well-covered stack, or threshing with a clover huller or well adjusted grain separator, should be prompt.

The "hard" seeds that may occur in alfalfa germinate readily in the soil. Even when mature and well cleaned, Ohio-grown seed may look less attractive than western-grown seed, but "performance counts." The better adapted the variety originally used, the older the meadow, and the more seed generations grown in Ohio, the greater the adaptation of this Ohio-grown seed will be to farms in the same section.

Broad Values of Alfalfa

A NEW satisfaction comes to those who venture into alfalfa farming and achieve what it offers. To the livestock farmer, its yield and lime and protein contents offer recognized feeding economy. To one interested in alfalfa as a cash crop, Ohio's geographic position gives a strategic market advantage. To both of these come the rotation values of alfalfa; a flexibility between grain and forage that permits meeting market trends; a higher level of grain yields, resulting from the field residue or the manure from feeding or from both; better utilization of the full capacities of the land—surface and subsoil. And lastly, alfalfa gives the farmer an opportunity to capitalize on managerial ability.